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ABSTRACT

Self-directed, or independent study activities were studied in adolescents, as well as their antecedents and consequences. The interrelationships, across age and grade, of several variables were described; i.e.: course requirements and conditions, student characteristics, study activities, and school achievement. First, autonomous learning contexts and activities were described and classsified. Models for studying aptitude-treatment-interaction and grade-level effects were also developed. Autonomous learning activities were categorized in two ways: (1) cognitive transformational activities concerned with manipulating the material to some end related to learning; and (2) task-oriented or information-processing-oriented cognitive activities. The following self-management activities were also studied: effort management, time management and behavioral monitoring. Five studying contexts were associated with certain autonomous learning activities. It was hypothesized that academic achievement depends on learning activities and self-management, and that the strength and nature of this relationship depends on course requirements and student characteristics. Also, as the grade level increases, so do demands on students' cognitive transformational and self-management activities. Autonomous learning activities increasingly account for achievement variance. (GDC)

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DIMENSIONS OF AUTONOMOUS LEARNING: A FRAMEWORK FOR INVESTIGATING ATTRIBUTE-TREATMENT INTERACTIONS IN UNSUPERVISED SETTINGS

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Dimensions of Autonomous Learning
A Framework for Investigating Attribute Treatment Interactions in Unsupervised Settings

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Abstract

Gaps in our knowledge about what adolescents do when called upon to learn on their own has led to a comprehensive investigation of the antecedents and consequences of students' autonomous learning (study) activities. Chief among the hypotheses that guide this investigation is that the relationship between autonomous learning activities and achievement will vary with both course demands and characteristics of students. This paper presents the hypothetical model that gave rise to the investigation and the classification schemes that have guided instrument development. A discussion of the interrelationship among task, student characteristic, study activity, and achievement factors is provided in terms of attribute-treatment interactions.

A substantial portion of the learning associated with schooling occurs in unsupervised settings. Students, at all levels, are routinely expected to carry out a variety of self-instructional activities, essentially on their own. These activities include completing homework assignments, reading and extracting information from texts, taking notes from lectures, and reviewing criterion information in preparation for examinations. By the time students reach the college level, expectations for carrying out self-directed learning tasks are both prevalent and explicit on the part of instructors, and the ability to engage in sustained autonomous study is viewed universally as the hallmark of the mature and competent learner.

Yet, despite the prevalence of these expectations, the significance of autonomous learning activities has been widely unappreciated. Study skills and activities have been typically regarded by school people as either behaviors that students pick up on their own or as the instructional responsibility of some other department or level of schooling. Shifts in psychological theory toward a recognition of the importance of generative processes in learning and a growing dissatisfaction with high school graduates' preparedness for postsecondary education and training has led to an increase in the visibility of studying (Rohwer, 1984). For example, there are now remedial study skills programs or institutions such as student learning centers on almost every college campus, and these programs and centers draw students from the topmost ranks of academic ability.

Despite this surge of interest in studying, relatively little is known about the dynamics of autonomous learning or about the antecedents of productive and unproductive study behavior.[1] This is largely due to a preference on the part of investigators to study learning in situations where control can be achieved through supervision, direction, and constraints on time. But, in addition, what little research is available on unsupervised studying has suffered from a reliance on descriptive or correlational methods and on instruments that aggregate students' scores across study contexts. In both learning and test development research, study activities have been described without reference to the course demands that instigate them, the expectations and intentions that guide student effort, or the varieties of criterion tasks that serve as the goals of studying. The result has been contradictory studies about the worth of particular study strategies such as notetaking, and the development of a number of instruments that fare poorly in validation studies (Weinstein, Schulte, & Cascallar, 1983).

Recent research on studying, on the other hand, leads to a very different approach to the study of autonomous learning behavior. As Rohwer (1984) points out in his call for a psychology of studying, the relative contribution that study activities make to academic achievement seems to depend in large measure on both environmental factors, such as course requirements and the nature of the criterion (Anderson & Armbruster, 1982), and on

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[1]The phrases autonomous learning activities and study activities will be used interchangeably in this paper to refer to learning activities that students engage in under their own direction.

characteristics of students, such as patterns of motivation (Biggs, 1984). Effective study practices may be more contextually dependent than has been recognized in past research.

The many gaps in our knowledge about such an important component of education led us to initiate a comprehensive examination of study practices across the years of adolescence. The frameworks presented in this paper were developed as guides for this investigation. In keeping with our long-term goal of developing a psychology of studying, our interest is in describing not only the variety of study activities exhibited during adolescence, but in identifying their antecedents and consequences as well. Our intention is to describe the interrelationships, across age and grade, of several classes of variables: course requirements and conditions, student characteristics, study activities, and school achievement. The design of such a comprehensive investigation required the development of several frameworks. These frameworks were used to guide instrument development, hypothesis generation, research design and data analysis. Some of the initial frameworks to be discussed in this paper are the following:

1. A scheme for describing the universe of distinct kinds of learning and learning-related activities that students of this age group may elect to engage in when learning on their own.

2. A classification of autonomous learning contexts.

3. A listing of the environmental conditions that could affect study activities. These environmental conditions should include text features, test characteristics, grading practices, lecture and review practices, and procedures related to assigned readings.

4. A definition of the major characteristics of students that might influence students' study activities, either directly or through interactions with course conditions.

5. A model for generating hypotheses regarding the relationship among course requirements, student characteristics, study activities, and educational outcomes.

6. A companion model, to number 5, that describes the interrelationships among these factors as a function of age and grade.

The investigation, which began approximately nine months ago, was designed to proceed in two phases. The first phase was intended to provide an opportunity to obtain an initial test of the central hypotheses of the study using descriptive techniques. The second phase will allow for experimental verification of these hypotheses. The remainder of this paper describes the conceptualizations that have guided this first phase of the study.

Table 1 presents a classification of autonomous learning activities. Autonomous learning activities can be thought of as being made up of two classes of activities or capabilities: (a) Cognitive transformational activities are those that are concerned with manipulating the material to be learned toward some end related to learning; (b) Cognitive activities are task or information-processing-oriented activities in nature. A second class of activities under investigation are self-management activities. These activities are primarily focused on the individual and the intensity and degree of persistence of his/her activities rather than the demands of the task. According to our conceptualization as displayed in Table 1, cognitive transformational activities include five subclassses of activities. Differentiation/selection activities are decision-

TABLE 1

AUTONOMOUS LEARNING ACTIVITIES

CLASS OF ACTIVITIES	TYPES OF ACTIVITIES	ACTIVITIES
COGNITIVE TRANSFORMATIONAL ACTIVITIES	DIFFERENTIATION/SELECTION • Seeks out, identifies criterion information • Differentiates important from unimportant information • Differentiates between sources according to importance and criteria relevance • Applies strategies for recording differentation • Selectively allocates attention according to content-criterion relevance, content difficulty, and content mastery	• Generates focus topics/questions before studying • Skims reading first • Seeks out criterion information • Reads selection material first (notes, summaries, etc.) • Skips unimportant parts • Identifies important parts • Notes selection information • Highlights • Spends extra time on important/ criterion/unmastered material • Reviews selected information • Infers criterion information from cues
	COMPREHENSION • Identifies comprehension difficulties • Applies strategies to alleviate comprehension problems • Applies strategies to promote comprehension	• Notes comprehension problems • Uses context cues or other sources to correct comprehension difficulties • Reviews or tests oneself to insure comprehension
	MEMORABILITY • Applies procedures for insuring the memorability of course content • Matches mnemonic procedures to content	• Uses mnemonic procedures to store important, hard-to-remember material • Applies or generates mnemonic procedures to match to-be-stored information: e.g., elaboration for terms, outlines for concepts, charts for relations among concepts • Applies or generates mnemonic procedures to match expectation of criterion performance: e.g., flash cards for constructed response, practice questions for essay

TABLE 1 (continued)

	INTEGRATION	
	• Applies procedures for insuring the integration of ideas within sources and between sources • Applies procedures for insuring the integration of ideas with previous knowlege	• Identifies relations among ideas: comparison, cause and effect, problem-solution, attribution, classification, sequence, etc. • Generates appropriate frameworks and applies them to insure memorability: timelines, outlines, diagrams, charts etc.
	COGNITIVE MONITORING	
	• Evaluates the need for, workability of, and sufficiency of selection/differientation, comprehension, memorization, and integration activities	• Notices when a particular cognitive transformational activity (e.g., integration) would be useful • Monitors the implementation of particular strategies • Controls the use, modification, replacement of cognitive transformational strategies
SELF MANAGEMENT ACTIVITIES	EFFORT MANAGEMENT	
	• Establishes efficient environmental arrangements • Institutes procedures for self-direction of effort	• Establishes quiet, well-lighted study locations • Sets goals • Dispenses rewards • Acts to maintain attention and persistent effort • Avoids distractions, anxieties
	TIME MANAGEMENT	
	• Plans for and arranges a sufficient amount of study time • Carries out a distributed study schedule as required by cognitive demands	• Estimates required study time • Sets a specific study schedule • Plans a time allotment for each study session • Follows a schedule • Distributes study effort over time • Avoids procrastination
	BEHAVIORAL MONITORING	
	• Evaluates the need for, workability of, and sufficiency of effort-and-time-management activities	• Keeps track of sufficiency of effort • Keeps track of sufficiency of time allotment • Keeps track of quality of effort

making activities that involve when and how to process information differentially, for example, according to variations in criterion relevance. These activities include information-seeking and selective attention behaviors as well. Comprehension activities are devoted to furthering one's understanding of the content of a course. Memorability activities are engaged in in order to preserve the content or insure its retrieval with reference to some future test event. Integration activities are those that are employed in order to construct relationships that may be needed later, or that can enhance the meaning of the learning material through the process of relating ideas to one another. Finally, cognitive-monitoring activities are those that are engaged in in order to assess the need for and adequacy of the above-mentioned transformational activities.

Self-management activities include three types of activities. First, effort management activities are those that are performed in order to minimize competing demands and to insure adequate effort investment on learning tasks. The second class of activities, time management activities, serve to insure that adequate time is provided for conducting the necessary cognitive transformational operations. Finally, we hypothesize that there is a self-monitoring component to self-management activities as well. Table 1 also lists some of the specific activities associated with each of the activity types. Additional detailed lists that grew out of this framework were used to construct measures of autonomous learning activities. Before describing

these measures, it is necessary to present some additional frameworks.

Table 2 presents the framework that guided the design of most of the instruments used in Phase 1 of the investigation. The premise behind Table 2 is that different study contexts involve different kinds of demands on students' study activities. These contexts can be defined with reference to different (1) study settings, in-class versus out-of-class; and (2) study purposes: reading, attending lectures, and reviewing learning material. This yields a total of five distinct study contexts. As can be seen in the far right columns of Table 2, each context is associated with a unique mix of autonomous learning activities.

Figure 1 presents the basic set of hypotheses that gave rise to the study. First, academic achievement is hypothesized to depend, to a significant extent, on the activities that students engage in to transform and process learning materials, as well as on the self-management activities that students exhibit to keep up with a course and keep themselves on track during learning and study sessions. But the strength and nature of this relationship is seen to depend on two additional classes of factors: course requirements and characteristics of students. Course requirements, as will be seen in a subsequent table, can be thought of as including not only the implicit and explicit demands that an instructor makes in a particular course, but the tasks, course content, tests, lecture characteristics, and the conditions under which students must carry out their work as well. For example, courses that require students to synthesize lecture and reading content and that provide little support for these activities in

TABLE 2

Classes of Autonomous Learning Activities
Associated with Different Contexts and Purposes

Study Context: Setting	Purpose	Cognitive Transformational Activities	Self-Management Activities
Routine: In Class	Learning from a Lecture or Discussion	• Differentiation/Selection • Compehension • Memorability • Cognitive Monitoring	• Effort Management • Behavioral Monitoring
Routine: Outside of Class	Day-to-day Reading of Required Sources	• Differentiation/Selection • Comprehension • Memorability • Integration • Cognitive Monitoring	• Time Management • Effort Management • Behavioral Monitoring
	Routine Reviewing of Notes	• Differentiation • Comprehension • Memorability • Integration • Cognitive Monitoring	• Time Management • Effort Management • Behavioral Monitoring
Test Preparation: In-Class	Instructor-led Reviews	• Differentiation/Selection • Comprehension or Integration • Memorability • Cognitive Monitoring	• Effort Management • Behavioral Monitoring
Test Preparation: Outside of Class	Student-led Reviews	• Differentiation/Selection • Comprehension • Memorability • Integration • Cognitive Monitoring	• Time Management • Effort Management • Behavioral Monitoring

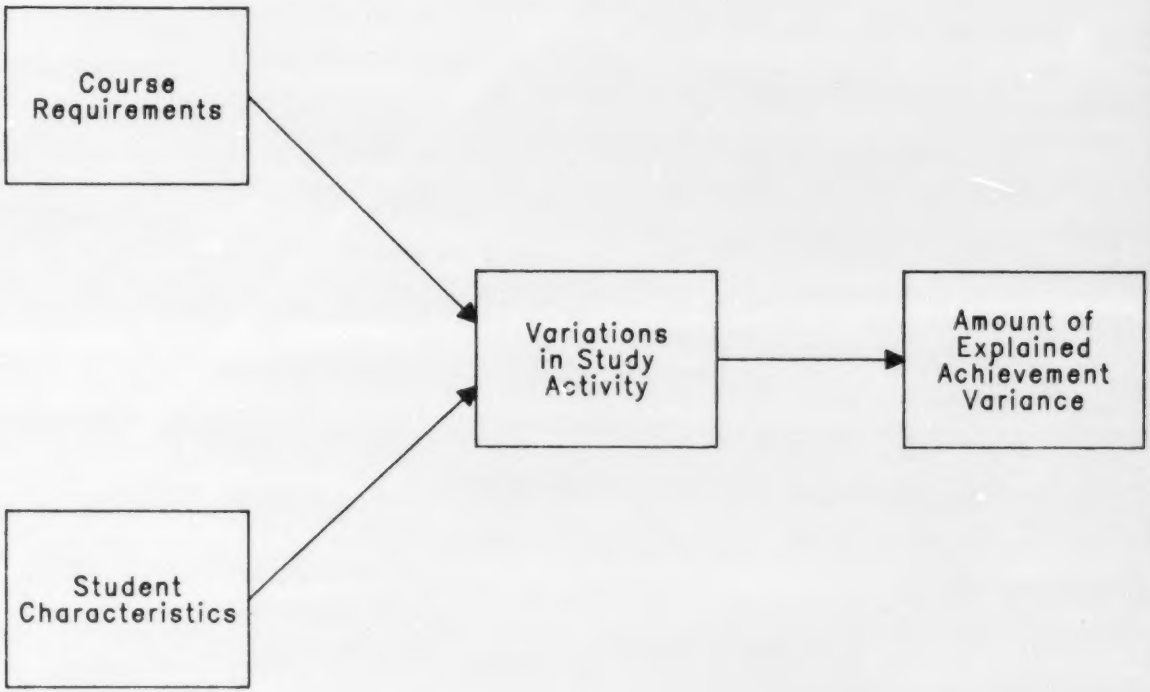

Figure 1. The relationship between study activities and achievement as a function of course requirements and student characteristics.

the form of handouts, summaries, reviews, etc., place greater demands on students' autonomous learning activities than do courses that require students to know specific bodies of information and that provide in-class practice relative to these objectives. According to our hypotheses, the relative amount of achievement variance that can be explained by looking at variations in students' study activities should be higher in the former case than in the latter. In like fashion, certain cognitive and motivational characteristics of students are hypothesized to influence study activities. For example, students' self-concept of academic ability, which is based largely on past success and failure experiences in academic settings (Covington, 1984), is particularly influential when it comes to how much effort students are willing to put in on a study task (Covington & Omelich, 1979). In practice, both classes of factors are expected to interact in their effect on study activities and on the study-achievement relationship (Anderson & Armbruster, 1982; Biggs, 1976; Rohwer, 1984; Thomas, 1980). In the case of self-concept of academic ability for example, the effect of this factor ought to be greater in courses that provide more latitude for out-of-class effort variations than in more instructor-monitored, lock-step courses.

Figure 2 displays our hypotheses regarding changes in the study-achievement relationship across the period of adolescence. According to these hypotheses, as grade increases, the implicit requirements that are placed on students' cognitive transformational and self-management activities increases. This increase

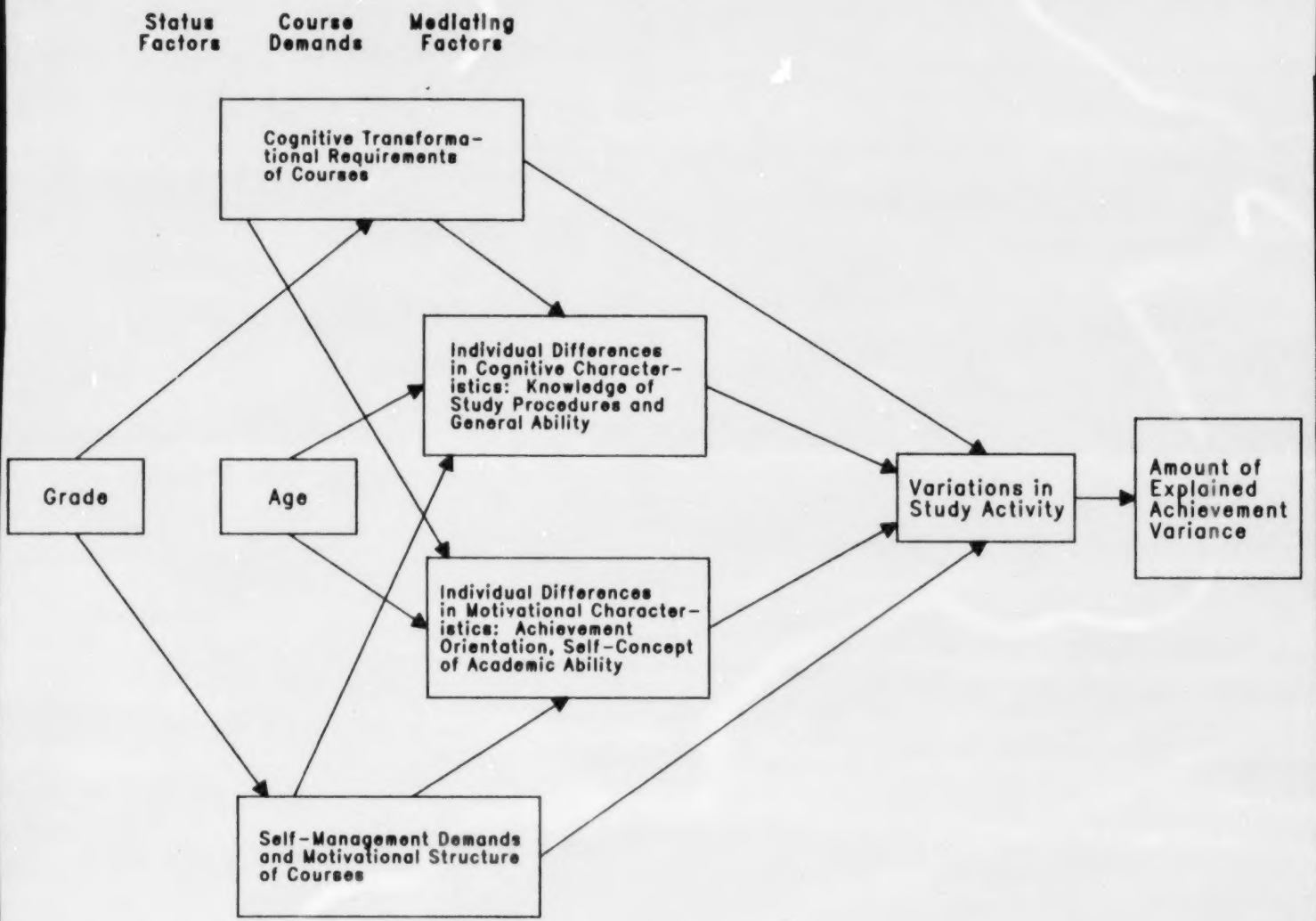
Status Factors
Course Demands
Mediating Factors
Cognitive Transformational Requirements of Courses
Individual Differences in Cognitive Characteristics: Knowledge of Study Procedures and General Ability
Grade
Age
Individual Differences in Motivational Characteristics: Achievement Orientation, Self-Concept of Academic Ability
Variations in Study Activity
Amount of Explained Achievement Variance
Self-Management Demands and Motivational Structure of Courses

Figure 2: A depiction of the relationships among status factors, student characteristics, context factors, study activity, and achievement.

in demands results in a corresponding increase in the importance of autonomous learning activities for accounting for variance in academic achievement. During this same period, as course requirements are making increasing demands on students' study activities, the influence of certain student characteristics such as knowledge of study procedures, general academic ability, achievement orientation, and self-concept of academic ability is becoming evident. A primary way that that influence is exhibited is through an effect on the character of students' study activities.

The apparent complexity of the study-achievement relationship across the period of adolescence, as shown in Figure 2, was an early cornerstone of our design. This complexity led to the need to identify or develop a variety of indices of course requirements, student characteristics, and study activities in order to trace and disentangle the relative importance of these factors across age and grade with respect to achievement. The full complement of indices and measures used in Phase 1 of our investigation of students' study activities is presented in Table 3. Considering the component of student characteristics, four measures are shown in the left-hand column. Two of these measures were of cognitive characteristics and two were of motivational or dispositional characteristics. The cognitive measures consisted of (a) a locally developed test of students' study knowledge titled the Course Comparison Survey, and (b) one of two measures of scholastic aptitude, depending on students' grade level. The Course Comparison Survey consists of 43 items that describe a particular study activity. Students select one

TABLE 3

Instruments Used in Phase I of the Autonomous Learning Project Study

Measures of Student Characteristics

Cognitive

Knowledge of Effective Study Activities:

Course Comparison Survey

Academic Ability:

Comprehensive Test of Basic Skills, Scholastic Aptitude Test

Motivational/ Dispositional

Achievement Orientation:

ACH via Conformity Scale and ACH via Independence Scale of the California Psychological Inventory (Gough, 1957)

Self-Concept of Academic Ability:

Short form of the Michigan State Self Concept of Ability Scale, (Brookover, Erickson & Joiner, 1967)

Indices and Instruments Used to Assess Implicit Course Requirements

In-Class

Lecture Characteristics (1,2)

- volume of topics
- volume of facts
- percentage of lecture time
- degree of mastery expectations for lecture topics
- degree of mastery expectations for lecture facts
- interrelationships of course topics
- abstractness of topics
- clarity of lectures
- conceptual level of treatment
- attention-holding nature of lecture
- distraction rate
- time devoted to recitation
- instructor previews
- instructor differentiates
- instructor summarizes
- attendance is required
- time devoted to examples
- volume of examples

Grading Practices (3)

- relative vs. absolute
- public vs. private
- can compensate for poor performance

In-class Reviews (1,2,3)

- new material introduced
- teacher vs. student direction
- test cues overlap with sources
- outlines, questions provided
- relational aids provided
- overviews, summaries provided
- amount of review time
- study management aid provided
- review assignments given
- practice items provided
- relational questions provided

Test Characteristics (3,4)

- number of idea units covered
- length of retention interval
- foreknowledge of content
- foreknowledge of format
- percentage recognition items
- percentage recall items
- percentage verbatim
- percentage paraphrase
- percentage interpretation
- percentage integration
- relevant sources named in advance

Out-of-class

Instructor's Methods Related to Assigned Reading (1,2,3)

- volume of assigned reading
- defined importance for grade
- expectation of mastery
- percentage of idea units per day
- multiple vs. single source
- frequency of assignments
- overlap with lecture topics
- instructor differentiates
- instructor checks progress
- instructor previews
- instructor reviews
- instructor reviews difficult material
- explicit integration demands
- instructor provides study guides
- written assignments given
- instructor gives feedback

Text Characteristics (3)

- readability (absolute)
- readability (relative)
- familiarity of words
- abstractness of words
- density of idea units
- abstractness of idea units
- definitional clarity
- clarity of idea units
- previews, organizers provided
- summaries provided
- examples, explanations provided
- relational questions provided
- highlights provided
- relational questions provided
- adjunct questions provided

1 *Course Questionnaire*
2 *Course Characteristics Observation Schedule*
3 *Instructor Interview Form*
4 *Document Analysis*

Measures of Study Activities

Routine Study Activities

Time Allocation:
Time Survey Form R

- In-class study time
- Out-of-class study time
- Out-of-class assignments
- Making study aids
- Reviewing

Study Activities:
Study Activity Survey Form R

- Self-monitoring
- Reading activities
- In-class study activities

Test Preparation Study Activities

Time Allocation:
Time Survey Form T

- In-class study time
- Out-of-class study time
- Out-of-class assignments
- Making Study Aids
- Reviewing

Study Activities:
Study Activity Survey Form T

- Self-monitoring
- Outside-of-class test preparation activities
- Inside-of-class test preparation activities

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of two descriptions of course conditions for which the activity would be more effective and then rate their confidence in this choice.

Two measures of motivational or dispositional student characteristics have been used in the Phase 1 study. First, students' achievement orientation was assessed using two scales of the California Psychological Inventory (Gough, 1957). The Achievement via Conformity Scale measures the extent to which students prefer externally-defined structure and control in their achievement behavior; the Achievement via Independence Scale measures the extent to which students prefer to work on their own. The second instrument in this class of instruments is a shortened version of the Michigan State Self-Concept of Ability Scale (Brookover, Erickson & Joiner, 1967) which measures students self appraisal of their academic ability and standing compared to others.

The middle column of Table 3 presents the contexts and indices used to assess implicit course requirements. In-class requirements and conditions relating to lecture characteristics, grading practices, instructor-led reviews, and test characteristics, and out-of-class requirements relating to assigned reading practices and text characteristics were assessed through the use of the four instruments listed at the bottom of Table 3: (1) a Course Questionnaire designed to elicit students' perceptions of course requirements, (2) a Course Characteristics Observation Schedule that was used to observe both routine and test preparation course meetings, (3) an Instructor Interview Form which was

used to obtain instructors' perceptions of the requirements of their courses, and (4) a series of procedures for coding and rating implicit course requirements as revealed by documents, including assigned texts and other readings, study aids, and tests.

Two measures of study activities were developed, one to assess the character of study activities employed, and one to measure the relative time devoted to different activities. These instruments are listed in the right-hand column of Table 3: the Study Activity Survey and the Time Survey. In keeping with the study context framework displayed in Table 2, two forms of each instrument were developed, one to cover routine activities (Form R) and one to assess test preparation activities (Form T). All forms of both tests were further divided into in-class and out-of-class activities. All tests, forms, and sections included questions regarding students' specific autonomous learning activities, and difficulties with respect to those activities, according to the distribution shown in the right hand columns of Table 2.

Companion papers to this one describe the particular sampling and test administration procedures that were used in the field test of the instruments. These papers also discuss some of the collected data that were relevant to the hypotheses presented in Figures 1 and 2. The remainder of this paper will be devoted to an examination of how present and future data can be used to identify relationships among course requirement variables, student characteristics, autonomous learning activities, and academic achievement.

Table 4 presents matrices that display classes of autonomous learning activities and course requirements associated with out-of-class test preparation contexts. Tables of this kind can be set up to organize data from the field test for all of the classes of course requirements shown in Table 3 and can be done separately for in-class versus out-of-class and routine versus test preparation settings. The purpose of this exercise is to look for possible interactions between course requirements and autonomous learning activities through an examination of patterns of correlations. For example, courses differ regarding whether or not the content of examinations are known in advance by students. We would expect that differentiation/selection activities would be more various and intensive in courses where the test content is not known than they would be in courses where the content is known. In the former case, the course puts high demands on students' differentiation/selection capabilities; in the latter situation, the instructor decreases course demands through compensatory action. Everyone is of equal standing with regard to knowing what to study and what not to study. Thus, we might expect an interaction between the tendency to engage in differentiation/selection activities and course achievement across these courses. Moreover, we might also expect interactions with student characteristics in this example. As the importance of student effort increases, the importance of individual differences that affect that effort should increase.

The example matrices presented in Table 4 can also be used to test hypotheses, in a provisional way, regarding the general

TABLE 4

Demands on Out-of-class, Test-preparation, Autonomous Learning Activities Associated with Different Course Conditions

TEST CHARACTERISTICS

AUTONOMOUS LEARNING ACTIVITIES		High number of idea units covered	Long retention interval	Content is unknown	Format is unknown	High % recognition items	High % recall items	High % composition items	High % verbatim	High % paraphrase	High % interpretation	Content known in advance	Format known in advance	Relevant sources explicitly identified
COGNITIVE TRANSFORMATIONAL ACTIVITIES	Differentiation/ Selection													
	Comprehension													
	Memorability													
	Integration													
SELF MANAGEMENT ACTIVITIES	Effort Management													
	Time Management													

GRADING PRACTICES

INSTRUCTOR'S METHODS RELATED TO ASSIGNED READINGS

AUTONOMOUS LEARNING ACTIVITIES		Relative scale grading	Grades are public	Absolute scale grading	Can compensate for poor performance	Large volume of assigned reading	Instructor expects to	In-depth understanding	No overlap with lecture topics	Instructor checks up	Instructor carefully	Instructor reviews	Interpretation checked	Study guides provided	Feedback given on written assignments
COGNITIVE TRANSFORMATIONAL ACTIVITIES	Differentiation/ Selection														
	Comprehension														
	Memorability														
	Integration														
SELF MANAGEMENT ACTIVITIES	Effort Management														
	Time Management														

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effects that course requirements might have on autonomous learning activities. In general, course requirements can be thought of as being demanding, supportive, or compensatory. That is, they can serve to increase the importance of a particular class of autonomous learning activities (demand), to foster or facilitate a particular type of activity (support), or they can obviate the need for engaging in such an activity (compensation). For example, with regard to assigned reading practices, a high volume of reading is a clear demand on student effort. It presents students with the need to engage in all of the classes of autonomous learning activities shown in Table 4, especially differentiation/selection. The presence of instructor-led reviews, on the other hand, serves to diminish course demands somewhat by providing support for one or all of the cognitive transformational activities. For example, no matter what its form, instructor-led reviews are likely to provide selection cues to students concerning what's most important or what might be included in an upcoming test. Finally, an activity such as the provision of study guides can be supportive or it can be compensatory, depending on the focus and detail of the guide. Of interest in future analyses will be differential relationships between particular course requirements and particular types of study activities, the relationship between demands, supports, and compensatory conditions on the one hand and study activities on the other hand, and finally, interactions between particular course requirement variables and autonomous learning activities depending on whether the requirement operates as a demand, support, or compensation.

In a fashion similar to the way we intend to approach the analysis of interactions between course requirements and student activities, data from the field test and subsequent field trials will be examined in order to test hypotheses regarding possible interactions between student characteristics and course requirements. Table 5 presents two types of analyses. The table labelled Example A presents a hypothetical interaction between the student characteristic referred to as knowledge of study activities and a combination of course requirements: the abstractness of the test and the provision of integrative aids. One hypothesis that we might test with the data would be that the relative tendency for students to generate integrative aids such as tables and summaries when studying for an examination should depend both on students' knowledge of what to do to relate course ideas together and the relative demands and supports associated with the assigned reading. In Example A in Table 5, students with low knowledge of study activities rarely report using integrative study strategies of their own design regardless of the abstruseness of the source. For knowlegeable students, on the other hand, such course requirements are crucial in prompting the appropriate autonomous learning activity.

Example B in Table 5 presents a second level of analysis which has the potential explaining variance in academic achievement by looking at interaction effects, again between student characteristics and course requirements. In this example, the relationship between students' scores on the two subscales of the California Psychological Inventory related to achievement orien-

TABLE 5

Two Frameworks for Examining Interactions
Between Student Characteristics and Course Requirements
(Data are illustrative)

Example A: Hypothetical interaction between student characteristics and course requirements in terms of tendency to engage in the development and use of integration aids for test preparation

Course Requirements: Text abstractness and provision of integrative aids	Student Characteristics: Knowledge of Study Activity	
	High Knowledge	Low Knowledge
High abstractness; no integration aids provided	(.80)	(.30)
Low abstractness; integration aids provided	(.40)	(.30)

Example B: Hypothetical interaction between student characteristics and course requirements in terms of the correlation between autonomous learning activities related to time management and achievement

Course Requirements: Instructor Checks on Progress	Student Characteristics: Achievement Orientation	
	High Achievement via Conformity	High Achievement via Independence
Frequent grade-related checks on progress	(.60)	(.20)
No checks on progress	(.20)	(.60)

tation are related to a single course requirement: how frequently an instructor checks on students' progress in the course. In the case of Example B, the illustrative values in parentheses refer to the correlation between the exhibition of autonomous time management activities and achievement in a particular course. Note that in this example, the relationship between this activity and achievement is quite different for the two groups of students depending upon the conditions of instruction. The willingness to engage in time management activities is associated with high achievement, but only when students are taught in their preferred mode of conformance or independence. The influence of frequent checks on the part of the instructor on students autonomous learning behavior and on the relationship between these behaviors and achievement might be discounted if student characteristics were not taken into account.

These examples, though illustrative at this stage, serve to highlight the central focus and initiating premise of the investigation. According to our analysis, students' study activities are not habits that students employ across tasks and time. Study activities, at least for proficient, successful learners are deliberate responses to the demands and conditions of the overall task. We expect that these activities will vary according to course requirements and, when these requirements become more demanding and less supportive of students' autonomous learning activities, a pattern we intend to look for across the adolescent years, the effect of these course requirements on autonomous learning activities and achievement, will be increasingly moderated by the cognitive transformational capabilities and motiva-

tional characteristics of students. As can be seen from this discussion, the long-term goal of developing a psychology of studying will require unique analytical frameworks and a complex data analysis plan. But, even more central to the challenge, achievement of our long-range goal will require systematic empirical validation in naturalistic settings.

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